Augmenting Administrative Data with Laboratory Data to Improve Quality of Care for Acute Kidney Injury

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Disclosures

- None

Objectives

- Drive quality improvement by standardizing early detection and reducing variability in the diagnosis of Acute Kidney Injury (AKI)
- Augment administrative coding data by linking with laboratory data to assess the true disease burden, severity, temporal trends, and clinical phenotyping
- Administrative and laboratory data together can inform conduct of quality improvement studies
- Demonstrate value of laboratory data to important stakeholders – patients, providers, health systems, and payers

AKI – Clinical Significance

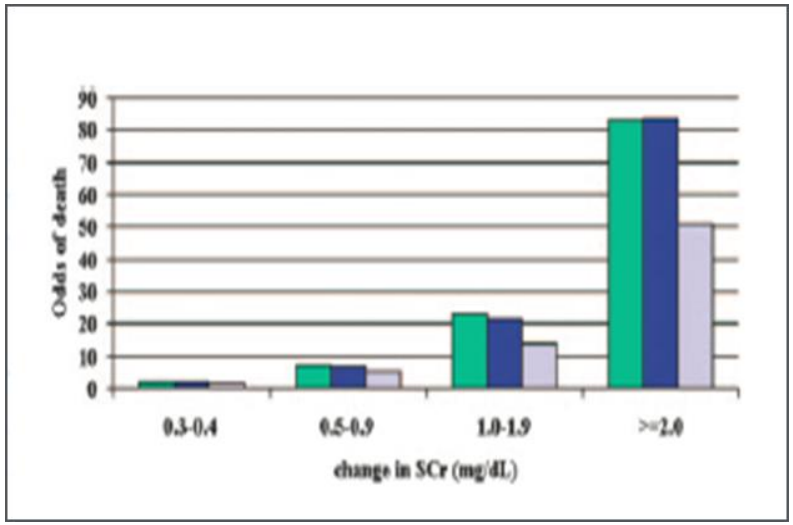
- 15-20 % of all hospitalized patients
- Majority cared for by non-nephrologists
- 20 to 30 % in critical care settings
- Frequent co-morbidity with all common disease states
- Broad problem in all hospital settings across all specialties

AKI – Economic Significance

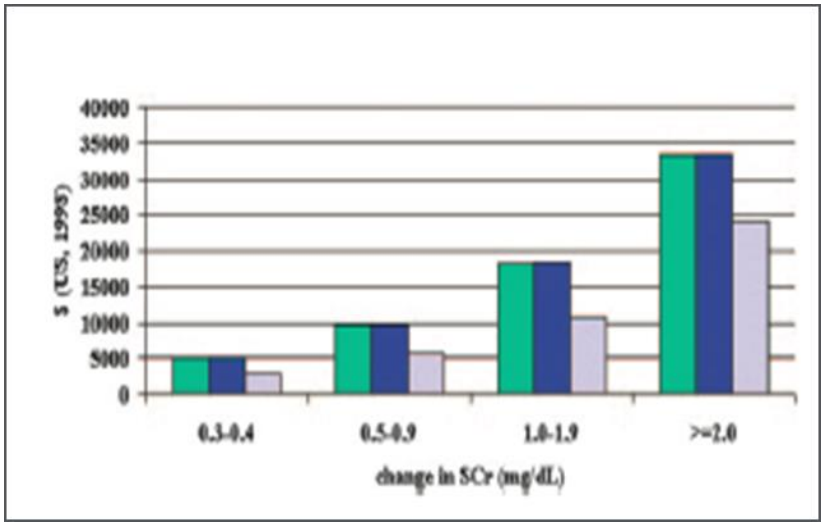
- Roughly 5% of total hospital costs
- "With conservative incidence rate of 5% - the annual health care expenditures that are attributable to AKI exceeded $ 10 billion in the United States" (Chertow et. al, 2005)
- Mortality, length-of-stay and costs worsen as AKI progresses from Stage 1 to 3
- Increased likelihood of Chronic Kidney Disease (CKD) and renal replacement therapy costs

Incremental Increase in Serum Creatinine (SCr)

Increased odds of death



Increased costs of care



AKI associated with increased odds of in-hospital mortality (6 to 30 fold), length of stay (3 to 7 days) and total costs of care ($4000 to $10,000) per patient encounter

Chertow GM, Burdick E, Honour M, Bonventre JV, Bates DW. Acute kidney injury, mortality, length of stay, and costs in hospitalized patients. *J Am Soc Nephrol.* 2005;16(11):3365-3370.

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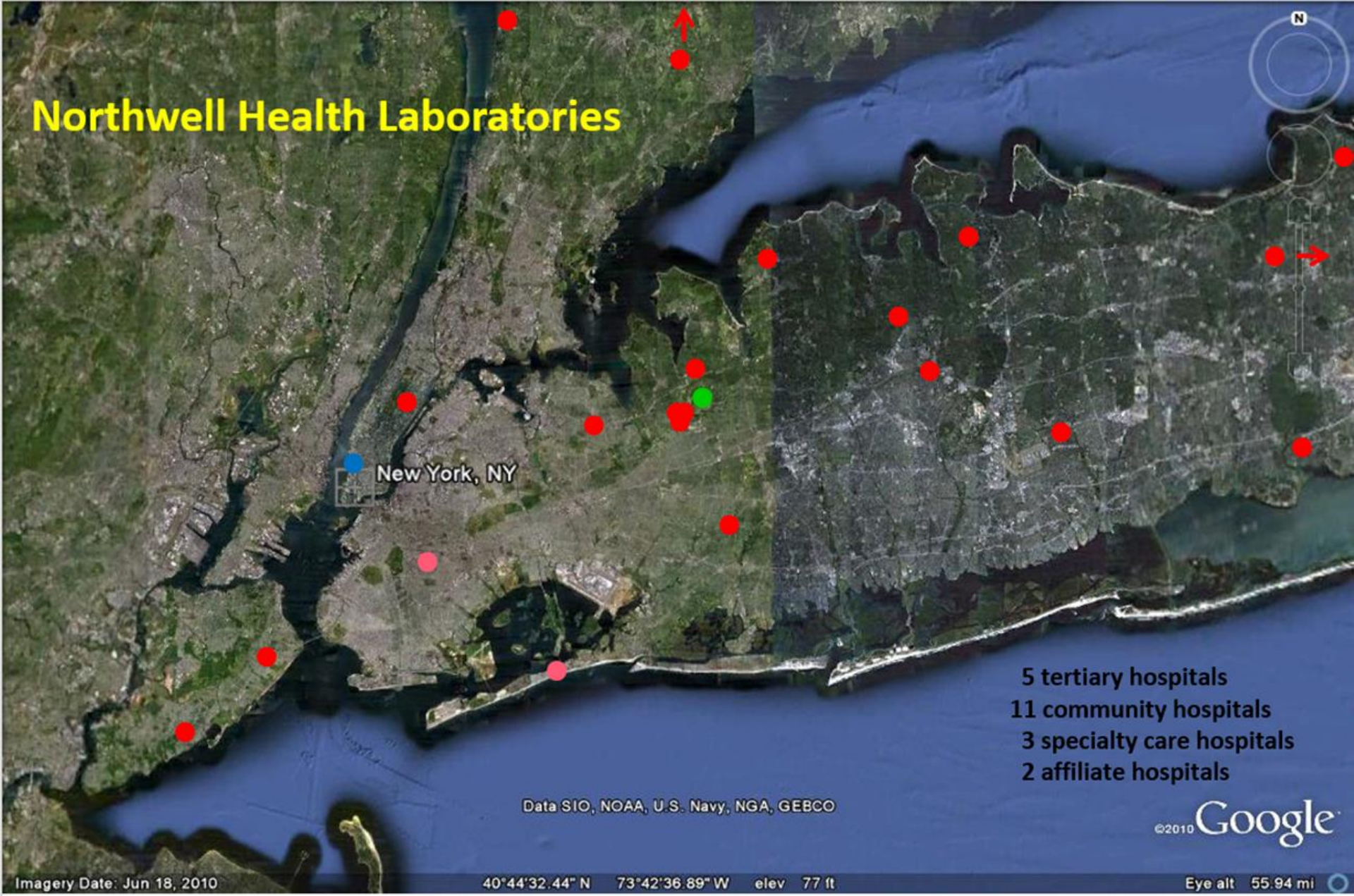
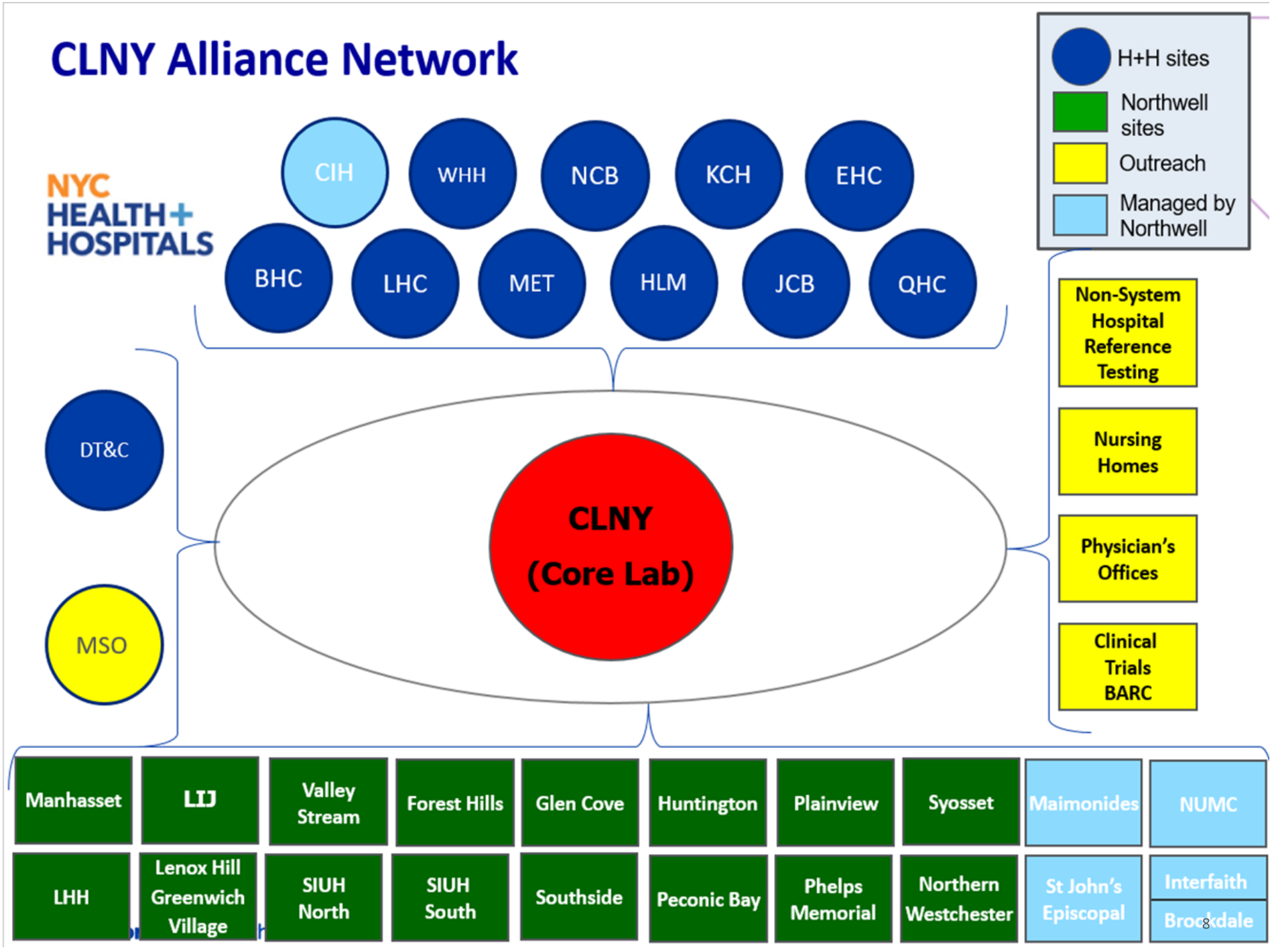


- Reference laboratory (9% of ambulatory market)
- 23 Hospitals (28% of market)
- Free-standing Emergency Room

600+ practice locations
Network of SNFs, AmbSurg, UrgiCenters
>4M patient encounters per year

CLNY Alliance Network



Problem Statement

- CMO of Forest Hills Hospital (250-bed, community hospital in Queens, NY) approached the laboratory leadership in July 2013

- Radiocontrast-induced AKI leading to 3 cases of AKI / day with 2 excess days per case

- Variable cost = $500 / excess day
  - 3 cases / day X 365 = 1095 cases / year
  - 2 excess days/case x 1095 = 2190 excess days in LOS
  - 2190 excess days x $500 per day = $ 1,095,000

- A million dollars in projected cost savings at one hospital alone. Huge potential for system wide savings

AKI Diagnostic And Staging Criteria Are Based on SCr

- **KDIGO Diagnostic Criteria** requires detection of small incremental rise in SCr above patient's baseline SCr value based on either one or both of the following criteria
  i) 0.3 mg/dl (26.5 µmol) rise above baseline within 48 hours (absolute)
  ii) 1.5 to 1.9 times baseline within 7 days (relative)

- **AKI Stages**

  Stage 1: SCr increase by >= 0.3 mg/dl (>= 26.5 µmol /l) from baseline or SCr increase by 1.5 to 1.9 times baseline

  Stage 2: SCr increase by 2.0 to 2.9 times baseline

  Stage 3: SCr increase by 3.0 times baseline or SCr >= 4 mg/dl (> = 353.6 µmol /l)

Why is AKI Under-diagnosed and Under-recognized?

- Applying evidence-based KDIGO guidelines prospectively and consistently in routine clinical practice has practical challenges
- Lack of awareness among providers, especially among non-nephrologists who most commonly encounter AKI
- Lack of effective clinical decision support (CDS) tools in the EMR that help in diagnosis within the normal clinical workflow
- Variable standards of care which contribute to sub-optimal clinical outcomes and high costs

Solution- Implementation of Laboratory AKI Alert

- Automated hospital wide real-time laboratory electronic alert using a modified delta checking algorithm within LIS
- LIS programmed to generate a report of all AKI episodes within the previous 24 hours with patient's room and bed location
- 'Rolling' minimum inpatient baseline SCr for delta checking
- Alert clinicians before creatinine value goes outside reference range so that clinicians can detect a rising trend
- A "roll-up" Alert Report to each Unit – rather than an EMR "pop-up" alert

Implementation of Laboratory AKI Alert

- At Forest Hills Hospital (FHH) → ~ 40 alerts / day which corresponded to 20 patients/day at-risk for AKI
- Extensive validation of the algorithm between Sept 2013 to Oct 2013
- Physician education and awareness campaign conducted by the CMO between Nov 2013 to Dec 2013
- Active engagement with physician champions and nursing staff
- Care navigators were tasked with following up on-all patients identified at-risk for AKI

Active vs. Passive alert – Embedding CDS in the workflow

- Active alerts reduce clinical impact because of alert fatigue and inability to assess patients in a systematic manner

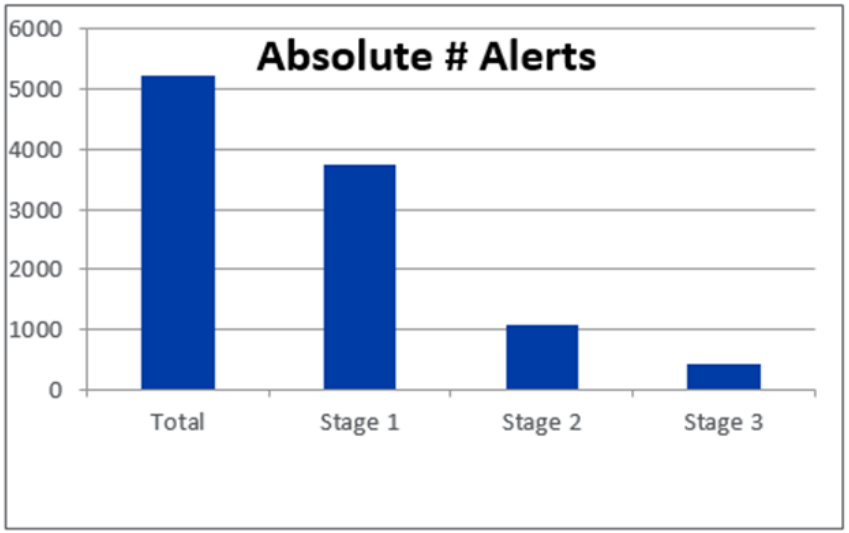
- Instead of generating one alert at a time, the LIS programmed to generate a report of all AKI episodes within the previous 24 hours with patient's room and bed location

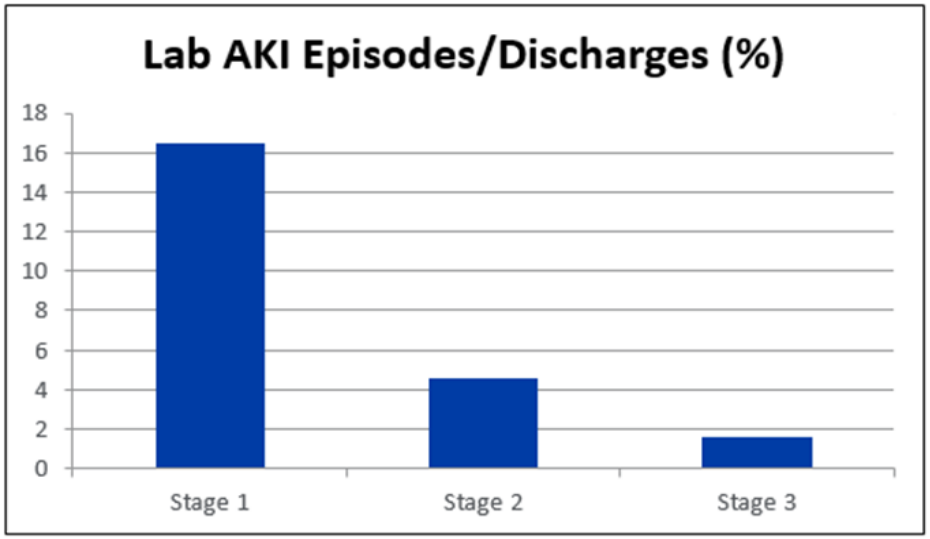
- Rounding tool: The report emailed to clinical and nursing leads of all units at 7 am in the morning

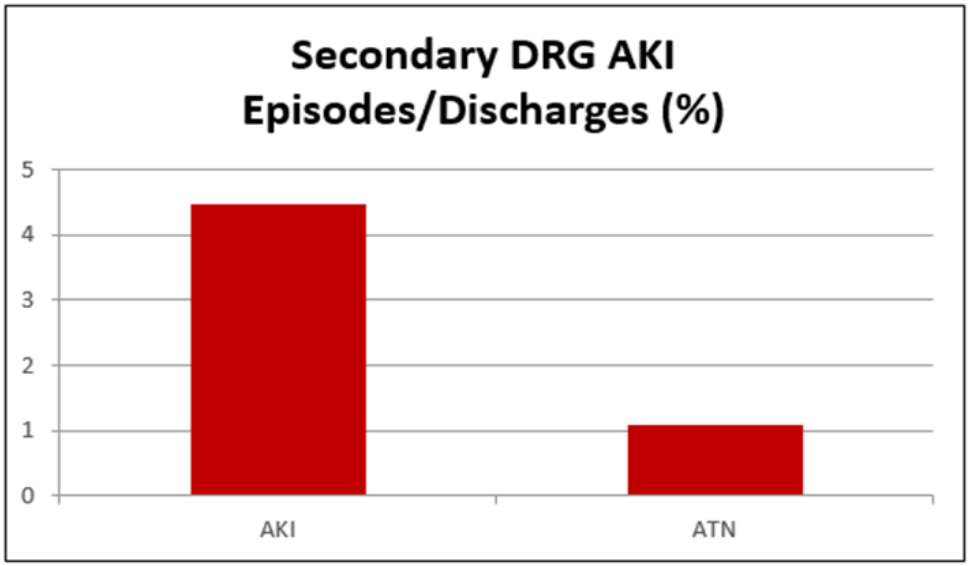
- Report discussed at 8 am ward rounds → ensure all members of the clinical team are aware of patients at-risk for AKI

- If these patients were clinically confirmed to have AKI → immediate management and intervention initiated (fluids, adjusting dose of nephrotoxic medications and more)

Single Hospital Pilot - Jan 2014 to Jun 30 2014







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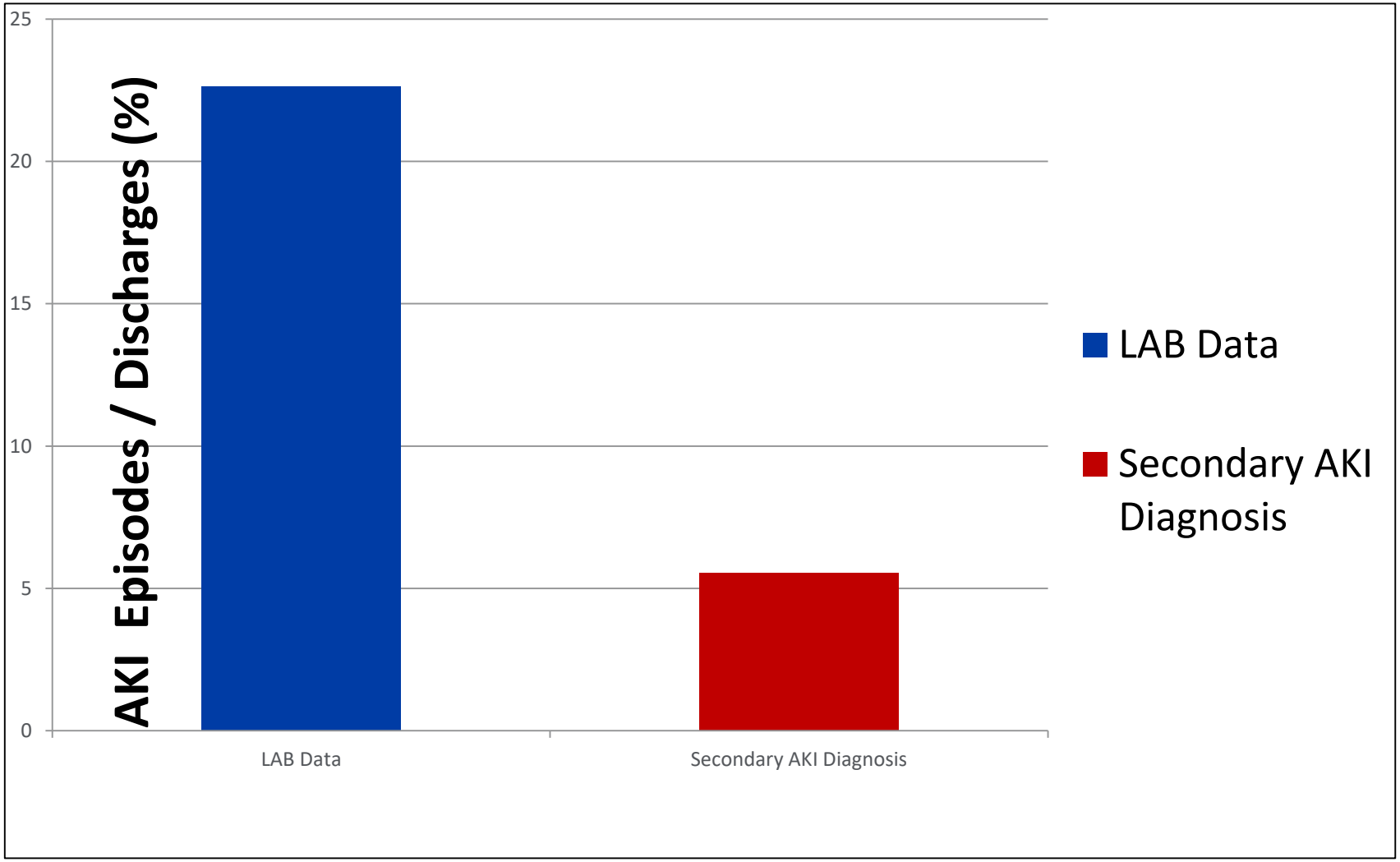
Single Hospital Pilot – January to June 2014



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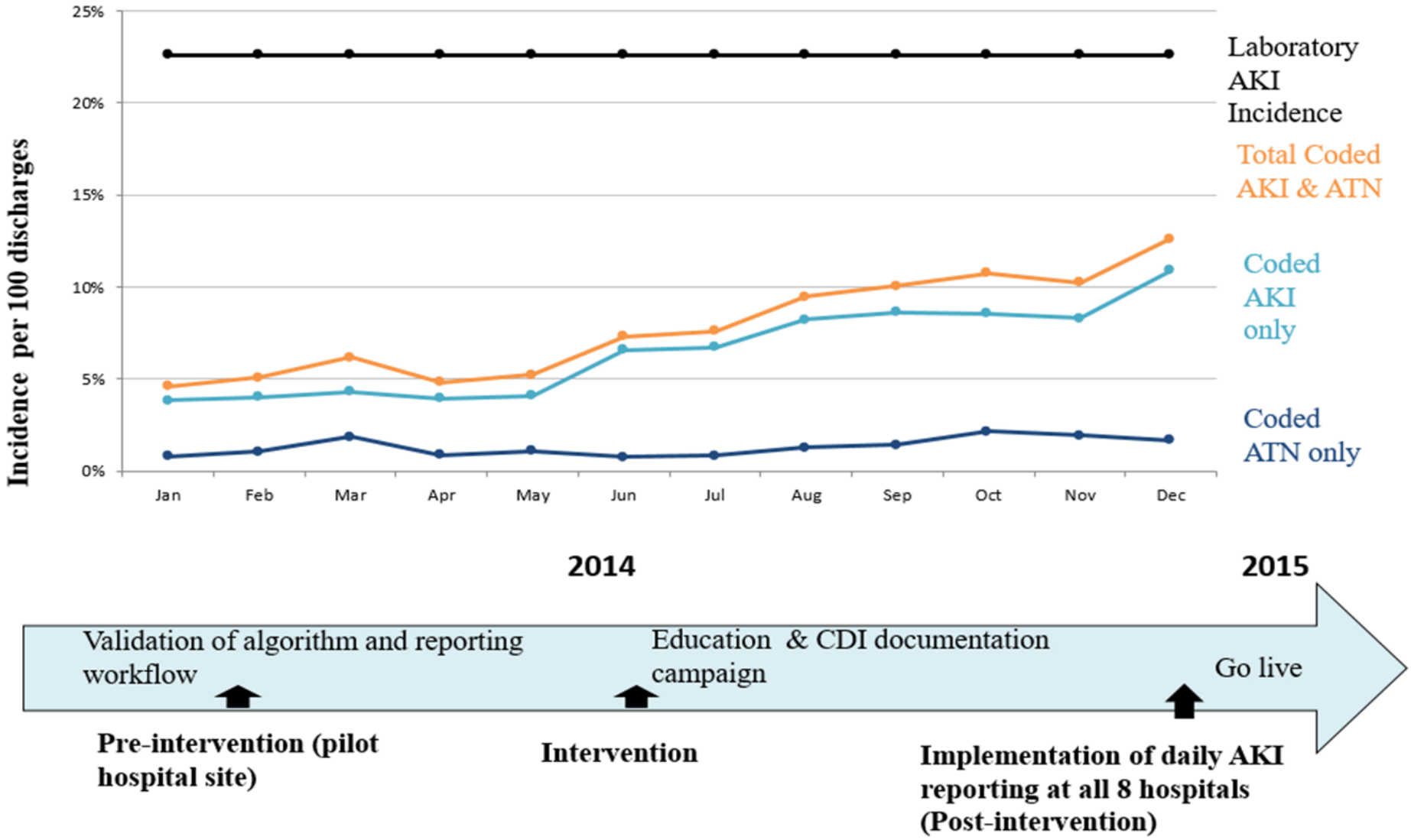
Laboratory Partnership with Hospital Chief Medical Officers and Health Information Management Team

- Administrative codes were not capturing incidence and severity of AKI
- Daily laboratory AKI report also sent to administrative and clinical documentation improvement (CDI) team
- Physicians educated by clinical champions and CDI specialists regarding assessment of AKI severity based on laboratory criteria as well as accurate clinical documentation
- Nurses and medical coders also educated about KDIGO criteria and limitations of administrative data

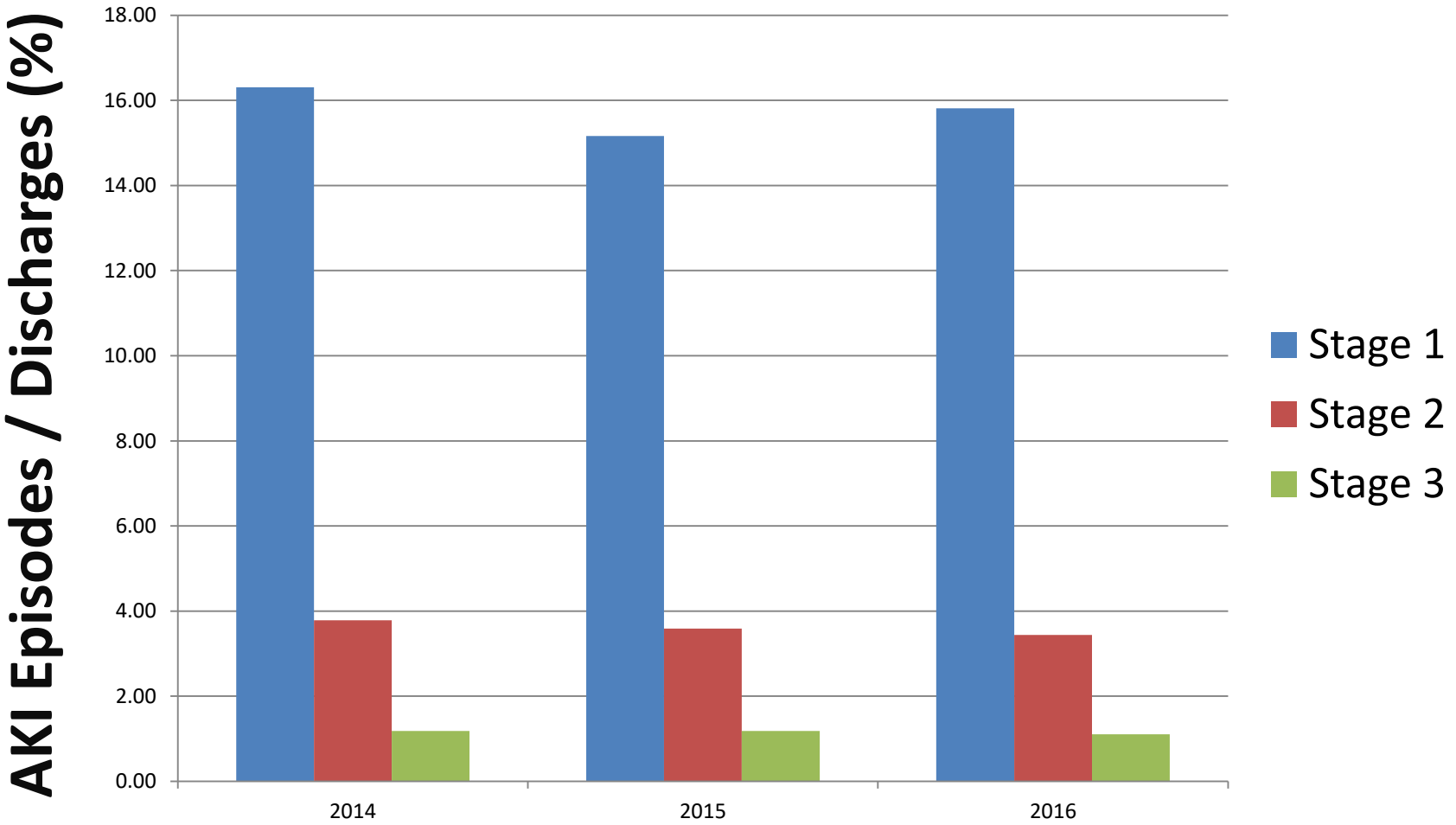
Timeline of Implementation of Laboratory AKI Alerting System



Diffusion of Laboratory AKI Alerting to Other Hospitals

- Daily AKI reporting implemented at 7 additional hospitals starting in January 2015
- Standardized reporting in the Cerner Millennium LIS – a single laboratory database mitigated interoperability gaps of EMR systems
- System-wide partnership between CDI and Department of Pathology and Laboratory Medicine
- Accurately stage AKI (stage 1 to 3) based on laboratory data and track incidence based on both laboratory and administrative data

Laboratory Data – All Hospitals (2014 to 2016)



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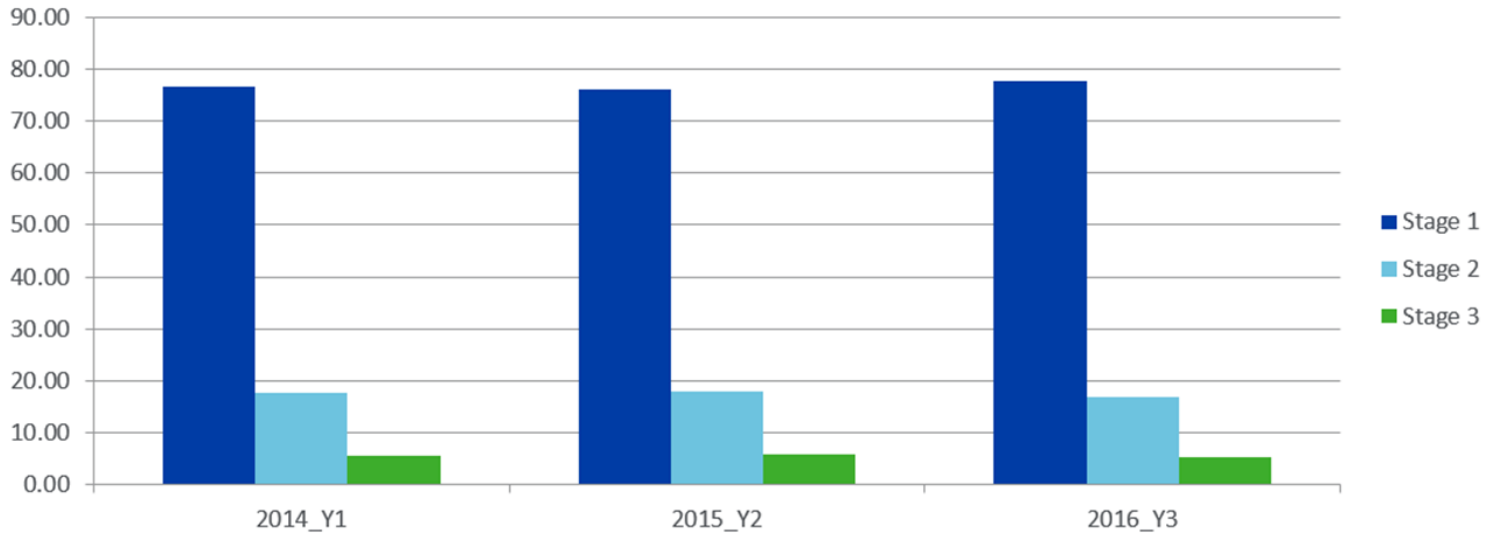
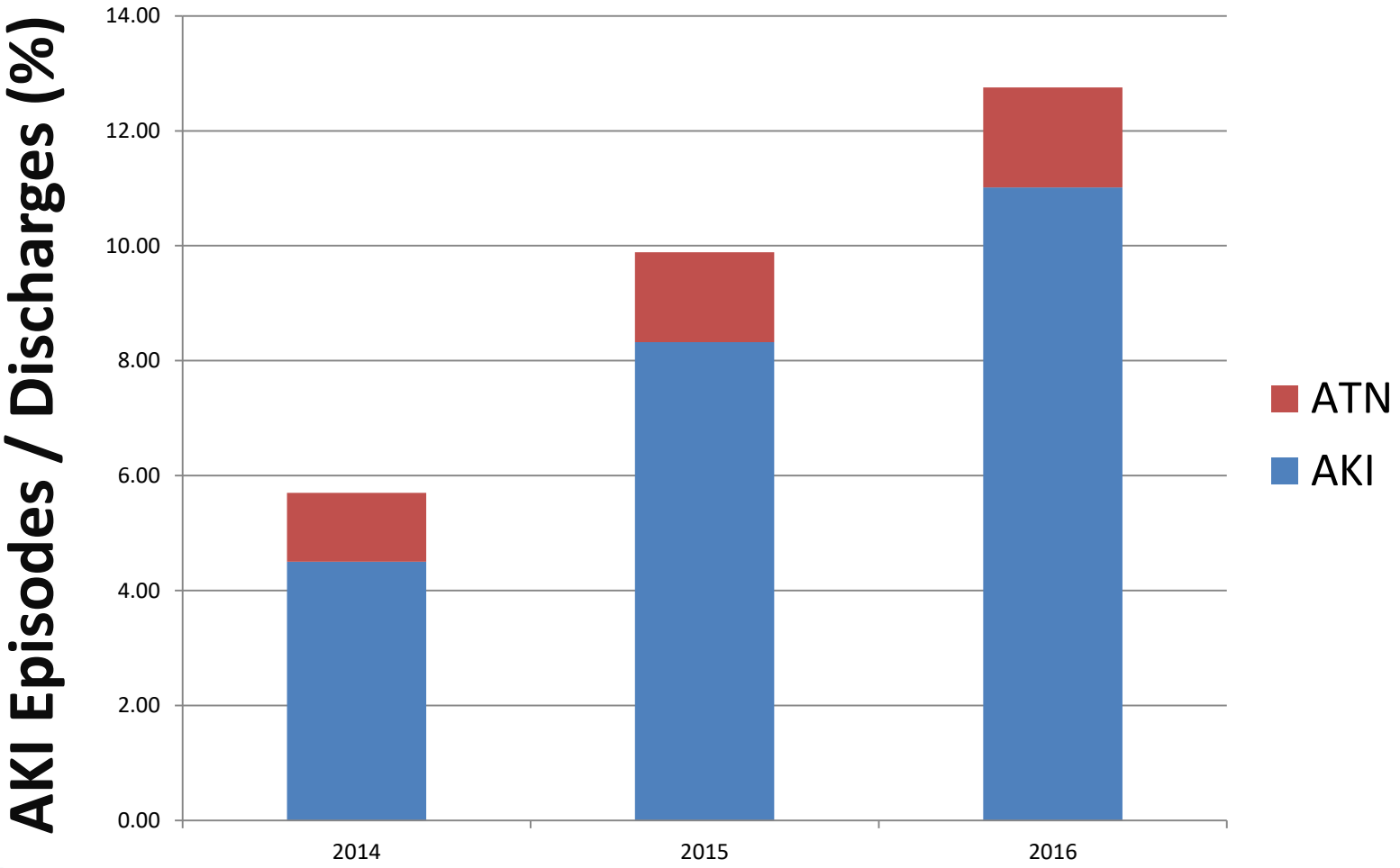
Laboratory Data – Severity of AKI Episodes Based on Stages



All Hospitals	2014_Y1	2015_Y2	2016_Y3
Stage 1 (%)	76.7	76.1	77.7
Stage 2 (%)	17.8	18.0	16.9
Stage 3 (%)	5.6	5.9	5.4

Secondary Diagnosis - All Hospitals (2014 to 2016)



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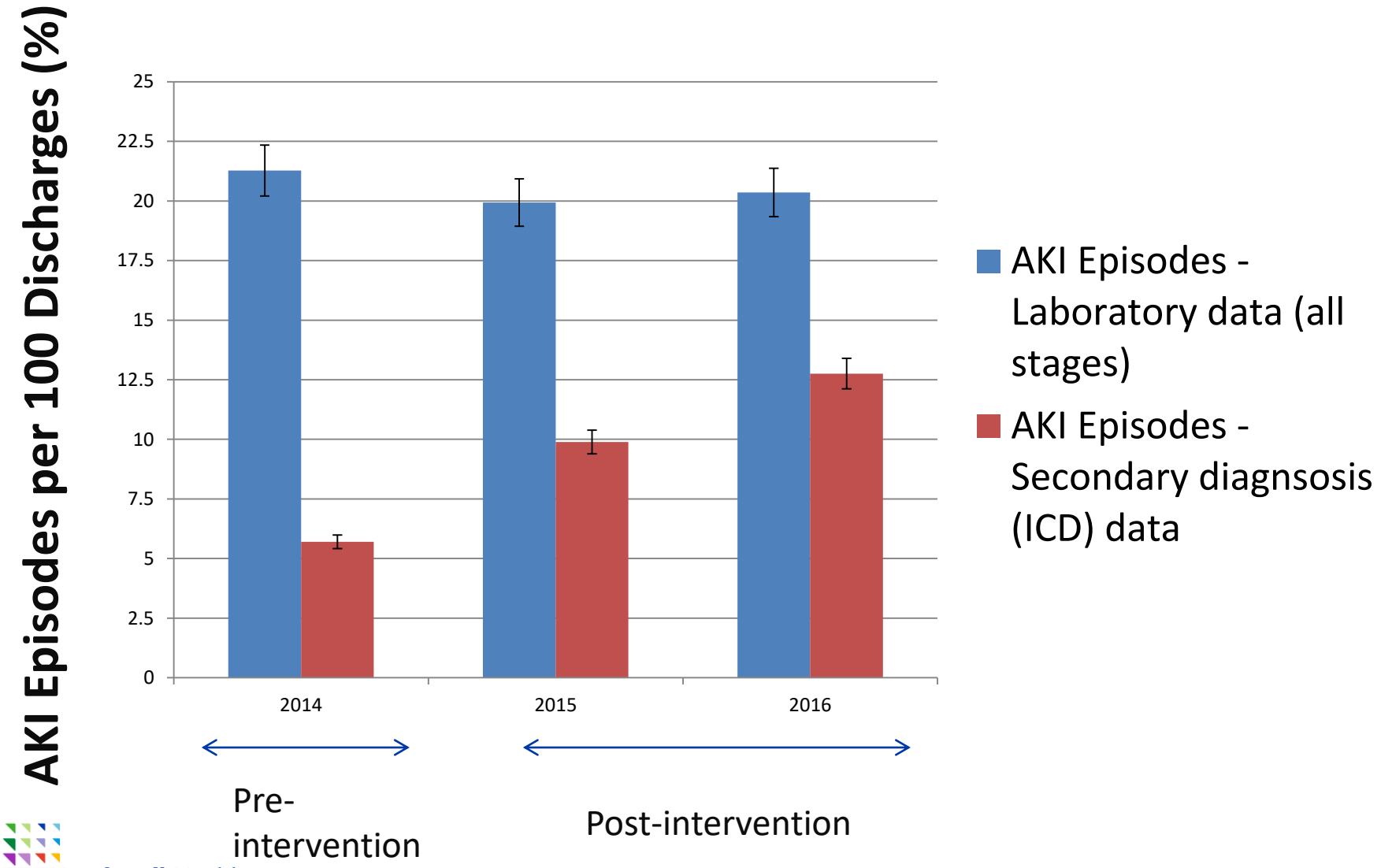
Laboratory and Administrative Data Before and After Intervention



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Lessons Learned – Improve Recognition of Early Stage Disease

- Primary diagnoses of AKI, especially stage 1 disease, are most commonly encountered by non-nephrologist physicians and administrative personnel, who may not have expertize in recognizing AKI

- Embed evidence-based KDIGO criteria within LIS and manage diagnostic information flow within the normal clinical workflow

- Educate physicians and change behavior in advance of implementation of any CDS alert

- Improve provider recognition and increase compliance with clinical documentation using laboratory data. Partner with your health information management personnel !!!

Lessons Learned – Limitations of Administrative Data

- Demonstrate poor sensitivity, poor PPV, high specificity and high NPV which leads to overly conservative estimates of disease burden, especially early stage disease

- Do not provide any information on severity of disease (stage 1 to 3) based on KDIGO criteria

- Are based on International Classification of Diseases & rely on non-consensus criteria based on histologic classification

- Do not capture the contextual phenotype (e.g. AKI secondary to sepsis, post-operative AKI) which is far more common

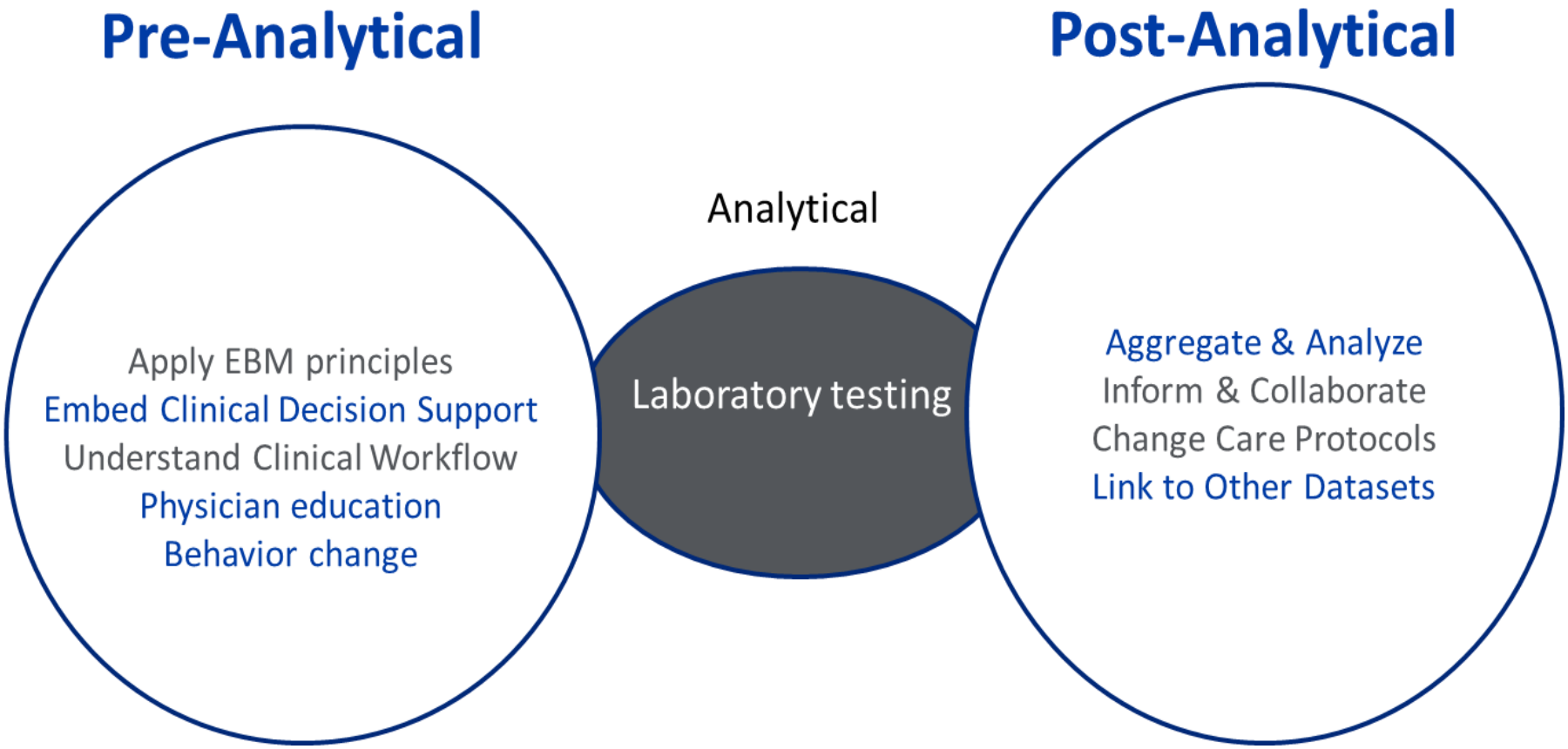
Lessons Learned – Augmenting Adminstrative Data with Laboratory Data

- Laboratory creatinine data can add significant granularity by providing vital information on:
  - **disease severity (especially early stage)**
  - **onset (hospital or community acquired)**
  - **chronicity (AKI vs CKD)**
  - **duration**
  - **recovery**
  - **temporal trends**
  - **long-term follow up of patients**

- Such enhanced administrative databases can be leveraged for long-term observational studies to study outcomes such as use of renal replacement therapy and mortality

Barriers to Enhancing Administrative Data

- Lack of access and understanding of administrative and claims data and how it can be used for quality improvement and population health
- Use of administrative data to improve clinical care is limited by time lag and there is no easy way to readily link it to real-time laboratory data
- Need involvement of stakeholders such as payers and hospital administrators to change the existing data infrastructure to fully leverage laboratory data
- Lack of single patient identifier prevents linking of inpatient laboratory data to outpatient data and prevents longitudinal follow-up of patients


Pre-Analytical
Post-Analytical
Analytical
Apply EBM principles
Embed Clinical Decision Support
Understand Clinical Workflow
Physician education
Behavior change
Laboratory testing
Aggregate & Analyze
Inform & Collaborate
Change Care Protocols
Link to Other Datasets

Value of Laboratory (Data)

- **Value to Providers**
  - Provide clinical decision support based on evidence-based criteria
  - Reduce variability and latency in diagnosis and prevent disease progression

- **Value to Health System and Payers**
  - Improve clinical documentation of disease severity
  - Understand true disease burden in the population (i.e. risk)
  - Reduce inpatient dialysis costs for severe AKI because of early detection
  - Reduce incidence of CKD post AKI episode and long term costs

Project Santa Fe

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Improving American Healthcare Through "Clinical Lab 2.0": A Project Santa Fe Report

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